Abstract

Unique Uses for Laser Scanning at Five Historic Sites

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Planet 9 Studios is a San Francisco based 3D data and software company. Our team of engineers and artists thrive on problem solving and the unique challenges that our customers bring to us. The projects illustrated in this poster are the result of teaming with the San Francisco architectural firm Architectural Resources Group (ARG) and their construction arm Architectural Resources Group Construction Services (ARGCS). It is our hope that by presenting case studies showing solutions for unique laser scanning problems that it may help you to see new uses for laser scanning in historic properties. They will also show projects that choose to invest and high resolution scanning and BIM modeling and subsequently found unintended uses for these materials.

Alcatraz - In 2011, ARG asked us to provide HABS documentation, prior to the painting of the Water Tower at Alcatraz in San Francisco Bay. Our team scanned the site using a Faro LS880 scanner with a point cloud density of about 50 mil. points per scan. In all, we produced 17 scans of the water tower, work yard wall and surrounding rock faces. The scans were used to create a detailed 3D model in 3DS Max from which 2D HABS drawings were extracted.

Shortly after delivering our work, we were contacted by ARG and the NPS asking if we could extract outlines of the graffiti on the water tower. During the Native American occupation of Alcatraz in the 1970's, slogans were painted high on the water tower. This graffiti is now considered historic and NPS hoped to restore the graffiti once the water tower re-painting was complete. Using our AutoCAD based HABS drawings, we "un-wrapped" the cylindrical water tank to produce a flat drawing showing seams and rivets. Next, we used this drawing as a background in Photoshop to overlay UV reflectance images from our laser scanning and site photos. The resulting 580mb image had sufficient detail to clearly trace the outline of the graffiti in AutoCAD which can then be used to produce a stencil for the new graffiti.

Fort Point - In 2011 ARG / NPS asked us to scan and BIM model Ft. Point located under the Golden Gate Bridge. For those who have not visited this lovely building, it is a Civil War era fort with four floors of cross barrel vaulting and precise brick, granite and cast iron detailing. In all we produced 200 laser scans which were used to build a native Revit model in 3D. This Revit model is large, detailed and perhaps the most involved modeling project of our careers. NPS sees the resulting model as a durable historic record as well as a base for numerous repair and maintenance projects.

While in project meetings, we learned the NPS team involved in handicapped equivalent facilitation were planning computer animations to describe the fort to visitors who were unable to use the stairs

(the fort is without an elevator). Since the original Revit model was so detailed, we were able to bring it into 3DS Max where computer animations were produced. These materials will soon be on public display at the Fort and on its' web site.

Watts Towers - In 2005, we were asked by ARG to create a laser scanned historic record of Watts Towers in Los Angeles. Watts Towers was built by artist Simon Rodia between 1921 and 1954. In discussing the project with ARG and the material conservators of the site, we learned that they needed a better way to record and access maintenance and repair data for the site. We proposed adapting our US Navy BIM (building information model) software to provide a searchable 3D interface of the site that would allow conservators to pinpoint elements on the towers and get their complete history of repairs. We also helped the conservators to consolidate their files into a Microsoft Access database. Where possible open standards were used.

Five years later, we were contacted by the LA County Museum of Modern Art (LACMA), the new managers of the Watts Towers World Heritage Site. They asked if we could adapt the earlier BIM software to work online so that more conservators could access and monitor the site. Since our work was mostly built using open, web-based standards, this was easily accomplished. Our main activity was in migrating the MS Access database to open source PostGIS. This new site is online and in use and LACMA is considering making it available to the public for educational uses!

Cantor Center Art Museum at Stanford - Cantor Center is a neo-classical, Civil War era fine arts museum located on the Stanford Campus, in Palo Alto, CA. ARGCS, the restoration contractors for the building, were posed with a difficult task to replace the leaking skylight over the main entry lobby to the museum. Normally, replacement of a large skylight would require the scaffolding of the space, production of plywood templates to reproduce the arc of the skylight members and the shutdown of the museum for several months. This was not acceptable to the Museum administrators.

ARGCS, asked us to laser scan the existing skylight inside and out. From the laser scans, we produced a detailed model in 3DS Max from which, we made plans and sections in AutoCAD. These materials were given to CS Erectors, the builders of the new skylight. The new skylight is meant to float slightly above the existing concrete ribs and be invisible from the lobby floor. The CS Erectors shop drawing team was very skilled and easily made use of the drawings that we had produced. The new skylight is scheduled to be installed later this month.

Crane Cove Park - Crane Cove is a former WW2 shipyard on San Francisco's southern waterfront. The site which laid derelict for over 30 years is now being turned into a public park. AECOM and their historical consultants ARG, determined that the two large tower cranes and other ship building structures were important cultural assets and should be the focal point of the new park. We were brought on board to laser scan the cranes and to produce bot 2D and 3D HABS drawings.

In the first project team meeting, we explained laser scanning technology and that our scans would accurately document the cranes and the ground area surrounding them. We were asked, if we made more scans, could be generate a topo map for the entire site? We said yes and with 87 scans documented the cranes and the entire site. We were also asked, by the structural engineer, if we could

extract structural shapes from the laser scans so that he could perform structural analysis on the cranes, we said yes and ended up annotating the 2D HABS drawings with the needed structural information.

We find laser scanning to be a powerful and accurate tool. We regularly find that we can measure historic sites more accurately and at a lower cost than traditional tape measure or Disto based approaches plus we are able to measure odd shapes and reach inaccessible areas. Later this summer, we will begin using a new generation of infra-red based scanners that are lighter and smaller than our bulky laser scanner. This will allow us to go where we have never scanned before and at a much lower price. We look forward to new challenges and to broadening the usefulness of these technologies!

About Planet 9 Studios

Planet 9 Studios is a San Francisco based, certified small business that provides 3D simulation services and software application development. Our team includes architects, 2D and 3D artists, Revit and AutoCAD experts, 3D laser scanning specialists and software engineers. Our customers include 14 Fortune 100 companies.

Founder David Colleen, started his career in San Francisco working on large commercial buildings and the renovation of historic buildings such as Hills Bros. Coffee (now Google) and Cogswell College (now the Ritz Carlton). David founded Planet 9 in 1995 and led his team to develop the first 3D applications online (VirtualSOMA), the first GPS units featuring 3D city interfaces in the US (Clarion and Magellan) and the first 3D building information models (BIM) for the US Navy.